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## CAN THE PSYCHOPHYSICAL EXPERIMENT RECONCILE INTROSPECTIONISTS AND OBJECTIVISTS?

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In the following article the writer assumes that it is exceedingly desirable (in order to establish psychology as a science and to promote necessary mutual understanding) that psychologists should agree upon the fundamental data of their investigative domain. Accordingly, he undertakes to point out that such an agreement not only appears possible but that there is in fact more agreement between psychologists of various schools than really appears on the surface. In fact the writer believes that he has found a possible basis for an almost complete agreement between introspectionists and objectivists in some recent discussion of the stimulus-error and the psychophysical experiment.<sup>1</sup> In addition the writer attempts to characterize what to him appear to be the conditions underlying the present dissension among psychologists and to propose some suggestions for overcoming such disharmony.

*I. Why Agreement among Psychologists seems Necessary.* Are not psychologists after all interested in the same series of natural events? If this question is affirmatively answered then agreement there must always be between psychologists no matter what their presuppositions are, provided that they exercise meticulous care to keep close to the facts within their special province of investigation.

Can it be to the advantage of psychology if the several psychologists indulge in such violent disagreements that they can question the value of each other's work and its scientific validity? And yet to the existence of such derogatory ideas of each other's work on the part of psychologists the content of our psychological literature could hardly bear more persuasive testimony. Surely a more united background for work than this seems to indicate is one of the first requirements for the advancement of any science. As a matter of fact the indispensable harmony among psychologists is supplied by the omnipresent peacemaker in two ways. In the first place, he tells us that after all there is no quarrel because the opposing parties merely study different aspects of the same actually existing data. The grain of truth in this contention is found precisely in the

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<sup>1</sup>E. G. Boring, *The Stimulus-Error*, this JOURNAL, 1921, 32, 449-471.

fact that if our opposing psychologists are dealing with facts at all there is really only one set of such facts. But as in the case of most intercessors there is no profound examination of the difficulty involved between contending parties. Thus the problem is not considered (1) whether the psychological data have in fact the alleged aspects, or (2) whether they can be separated and separately studied. Now in order that anything in the field of science should be a datum it must be a unit object or occurrence, and so we assume that the mediators to whom we refer consider the field of psychology to involve different kinds of facts. Indeed it would be strange if such a large field as that of psychology did not contain many different types of facts even if all individual occurrences constituted the same form of datum. As a matter of fact, it is possible for different psychologists to choose, for their particular study, reactions which differ from each other as thinking and reflexes. But are such basic disagreements as we find in psychology today merely due to the fact that psychologists are dealing with one or the other type of responses? No, the quarrels concern the nature of the data themselves.

The mediators, in the second place, claim that the violent disagreements in psychology do not much matter since introspectionism and behaviorism, let us say, are different hypotheses concerning the data of the psychologist's domain, and it is not so very important, they say, that psychologists should agree upon their interpretations. Such disagreements (they further say) are found in physics, that most stable of sciences, in which light, for example, is sometimes interpreted in corpuscular and sometimes in radiational terms. Here again we must point out that the opposition would not long survive if the opponents were not inquiring into the nature of their data rather than offering an interpretation of them. Consequently an entirely different condition prevails in psychology from that in physics, in which science no question is entertained concerning the "data" of light, for example.

Now, as we have indicated, such marked differences of opinion as today exist in the domain of psychology are hardly conducive to anything but futile argument. So far indeed is such violent dissension from promoting any real comprehension of psychological facts that we ought not to take lightly the existence of such extreme views as those of the different varieties of introspectionism and behaviorism. Rather we should attempt to discover what in the facts of psychology themselves argues for agreement concerning the data, no matter how differently such data might be later interpreted.

*II. Evidences of Possible Agreement in Psychology.* Signs are many and important too that much general agreement

is possible and in fact gradually being arrived at with respect to the data and fundamental principles of psychology. Tremendously encouraging is the discovery that students of psychological phenomena, although starting from different theoretical presuppositions, when bent upon a serious investigation of actual facts, can come to much the same conclusions concerning the character of psychological data.

Now it so happens that the original psychological experiment, namely the study of the psychophysical response, is capable of affording us considerable insight into the nature of a psychological datum. The psychophysical experiment is, in the first place, a fairly simple form of psychological reaction which has been thoroughly and frequently discussed; consequently we should experience no difficulty in studying the crude facts with the hope of arriving at some fundamental psychological agreement. For we have full faith that if we can only get down to our crude data with a complete freedom from philosophic bias<sup>2</sup> an effective *rapprochement* between psychologists will not only be possible but to a certain extent inevitable.

The second reason for hoping to find a basis for the reconciliation of psychological opposites by a study of the psychophysical experiment lies in the fact that a genuine attempt to come to an agreement is already to be found in Boring's recent discussion of the psychophysical experiment to which we have already referred.

Not that Boring has set himself the problem of harmonizing his psychological point of view with that of others who hold different attitudes concerning the subject matter and method of psychology. On the contrary, the fact is that Boring's analysis of the psychophysical experiment is designed to substantiate the structuralist's position<sup>3</sup> as over against that of

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<sup>2</sup>Is this possible? We believe not. Consequently the question here really is whether some philosophic or cultural attitudes are more conducive to the obtainment of correct results in psychology than others. Our suggestion would be that we might very profitably give up all cultural backgrounds which commit us to the procedure of transforming the fact of pressing a telegraph key, when an agreed-upon colored paper is shown, into a mentalistic fact before we can describe it. From this standpoint we look upon the structuralist's reiteration of the distinction between "Kundgabe" and "Beschreibung" as a "defense mechanism." We discuss this problem in more detail later.

<sup>3</sup>Frankly we anticipate that the reader may say concerning the writer's present paper, "Well, here is another view to accept instead of our own." Our reply would be that we are not at this point interested in advocating some type of psychology rather than another, but rather we wish to raise the question whether psychology does not suffer from the fact that psychologists are committed to some preinterpretation or other of their facts before they are studied. Also, we wish to make the more positive suggestion that all interpretations should be derived from an investigation of non-prejudiced data.

the functional-mentalist, and the behaviorist who is presumed to be anti-mentalist. And so whatever symptoms of agreement we may find in Boring's discussion are not due to his desire to make peace with other partisans; yet overtures for agreement we do find in Boring's work nevertheless, and for the simple reason that he offers us an extremely valuable description of the psychophysical experiment.

In order then to test our hypothesis, that a critical study of the psychological experiment may lead to agreement between psychologists, the writer who stands not committed to either the introspective-structural or so-called orthodox behavioristic views,<sup>4</sup> and much less accepting any combination of the two, plans to make a comparison of the descriptions of a psychophysical experiment when made from the introspective-structural point of view and from what the writer assumes to be an objective point of view, based upon no other presupposition than that we are investigating some definitely observable fact. We shall therefore proceed to our comparative analysis of the psychophysical experiment.

*III. The Analysis of the Psychophysical Experiment.* Describing the two-point limen experiment, Boring says we have (1) stimuli in the form of compass-points at different separations. Next we have (2) perceptual patterns which pass through a series from a single sharp point to two separated points. These patterns Boring calls mental processes, or process material for the datum (structural) psychologist. Between stimulus and process there is "assumed" to be (3) an excitatory process (neural action). Finally there is (4) verbal report. This series of processes as a matter of detail Boring thinks it advisable to look upon as a dependent one, each phase a resultant of the preceding.

Reserving until later the question of the shapes of the mental processes we must next look into what appears to be a series of factors connected with the four above. In the visual schema which our author uses (p. 446) and which we hope the reader will consult, he places between stimulus and excitation the term 'stimulation,' saying: "stimulus gives rise to excitation by way of stimulation." We take this to mean merely that the stimulus or object gives rise to an excitation process by means of a stimulating act. Again, between the term excitation

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<sup>4</sup>We sometimes wonder whether there exists such a person as an orthodox behaviorist (namely, one who thinks of the psychological datum as merely the action of muscles, nerves and glands) or whether he is a controversial artifact. If not, then the agreement of psychologists is more plausible than otherwise, and especially if it should turn out that there aren't any mentalists, that is, those who are committed to the view that the data of psychology are purely mental states.

and the term perceptual pattern, Boring puts the term 'attention,' and writes: "excitation culminates in perceptual pattern, under the selective action of attention." Now here Boring's meaning is not so clear; but we take him to mean that excitation is neural action or process and becomes transformed into or parallels a mental action or process. Finally, between the terms 'perceptual pattern' and 'report' Boring puts the term 'criterion,' with the following statement: "the perceptual pattern issues in a judgment in accordance with criteria of judgments that have been established." This statement we interpret to mean that the observer tactually perceives the stimulus and consequently is enabled to judge or say whether there was one or two points applied to the skin.

To us at least there appears to be a slight ambiguity in Boring's description, concerning which we might comment, since it is obviously essential that every item in our description must be carefully scrutinized. There are two points here. In the first place, Boring does not sharply distinguish what the experimenter does from what the observer does. The stimulation action is obviously that of the experimenter. To be attentive or inattentive is the action of the observer at the behest of the experimenter, as is also the work of observing the criterion. In the second place, there seems to be an attempt (at least verbally) to distinguish between two series of factors, one (stimulus-excitation-perceptual pattern-report) which does not stress action, while the other series (stimulation-attention-criterion) does. In the first series stimulus is certainly a thing and won't trouble us. Excitation is a condition and as an isolated process need not necessarily be called an action; report or judgment is clearly an action. But what of the perceptual pattern? Here we should like to have a more definite statement since our comparison of descriptions will hinge on this point. Criterion in the second series, although a noun in form, is, to judge from the context, without doubt meant to be an action.

Such then is the structural psychologist's analysis of the psychophysical experiment. Observe how an objectivist (let us assume that label for our present purpose) analyses the same situation. Our series of events runs as follows: we begin with (1) the stimulus; the next member of our series we call (2) the attention act. Then we have (3) a perceptual response followed by another act which we may call (4) an ideational, reflective, or judgment act. Then finally we shall have a final or consummatory act which we agree to call (5) verbal report.

Before attempting a comparison of our analysis with that of Boring we must point out that we divide our behavior situation into stimulus and response, the former consisting of the application of the compass-points to the cutaneous region in

question; in other words, the exertion of the pressure at a particular point. It happens to be true, of course, that in our experiment the stimulus phase of the situation involves the action of the experimenter, but this action is part of the stimulus. We may consider it as the setting of the stimulus, while the instrument-points we think of as the media of stimulation. According to the conditions of the psychophysical experiment as Boring describes them we must indicate that there is an additional or adjunct stimulus which consists of the instructions of the experimenter to be careful and to attend to the task at hand. Even without this addition it must be noted that the experiment would always involve two stimuli, one the pressure and the second the request to make a report. Were it not negligible for our present purposes we should have to include the warning to be careful as a second auxiliary or third stimulus. As it is we will try to keep the description as simple as possible. But we might add, however, that under certain conditions the first auxiliary stimulus we mentioned might be thought of as setting instead of stimulus.

The second phase of the act we call the response, and possibly in every case but a reflex action it consists of a pattern, namely the series (1) attention, (2) perception, (3) judgment and (4) verbal report. As to the interdependence of the members of the series we should agree that under definite experimental conditions and with a trained subject they may be practically dependent one upon the other, but it is certainly true that this is not always the case. For, as the experimental data all show, numerous errors in perception and judgment occur. That a wrong perceptual act (ordinarily called an illusion or a false judgment) should occur is entirely due we believe to the fact that what should be an organized progressive series of responses and stimuli do not operate in their expected order. It is more common of course in practice that the judgment should not follow its precurrent perceptual act than that the perceptual act should become dissociated from the stimulus. Under ordinary conditions also the verbal report might be expected to depend upon the judgment; but it might not, and certainly all kinds of slips can displace the connection of judgment and stimulus.

As to the nature of the response each member of the series is a definite adjustment of the person; in principle then all members are alike, being actions of the individual, but they differ in function and form. For us the verbal report is an act precisely like those called judgment, perception and attention; each consists of perhaps a single reaction system. We are especially eager to make this fact clear, for it is precisely in these details that the agreement or disagreement of psychologists

upon fundamental problems is possible. Our response, then, in the psychophysical experiment we may say consists of a series of reaction systems.

*IV. Points of Agreement and Possible Agreement in the two Analyses.* Unfortunately upon several points a complete harmony of interpretation between the two descriptions will not be found; but it is certainly true that upon essential points a fairly complete agreement exists. Let us proceed then to a consideration of the likenesses and differences of the two descriptions.

(1) A primary agreement and a most important one is that both undertake an analysis of the experiment. In both cases the reacting individual is studied in the sense that we may expect to be informed how he is stimulated, how he must conduct himself with respect to his attention to the problem in general, to his own action and to the stimulus. The importance of this point lies precisely in the fact that only upon such a basis can the student of psychology approach his data with an unbiased mind as to what these data are. We shall presently see that to look upon the reactions of the person as the data to be analyzed and otherwise investigated may be the means of avoiding unnecessary and harmful presuppositions.

(2) Another common result of the two analyses is the conclusion that the observer in the psychophysical experiment performs a series of definite acts or events, what we choose to call a pattern of response. The only question that may arise here is whether Boring would agree with us that the perceptual factor is an action of the person, in principle like the verbal report, but different from it as the perceptual act differs from an attention action. To this problem we plan to return presently.

(3) That the series of acts or events in a psychophysical experiment response can be divided into different functional parts is another very important point of similarity between the two descriptions. The parts are the end factor (vocal report) and the middle factors (attention, perception, judgment), called 'middle' because they lie between the report end-factor and the stimulus end-factor.<sup>5</sup> In the first place, such a distinction allows us to look upon the different members of the reaction series as merely functionally distinct, but not as different kinds of facts; and in the second place, it provides a basis for the individual study of the different factors.

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<sup>5</sup>Those who read this paper in conjunction with Boring's article (it was written with the assumption that it will be so read) will notice that I use terms which are not strictly mine or Boring's but rather derived from the two descriptions. I purpose, however, to guard carefully against ambiguities and especially against giving the impression that Boring accepts any interpretation of my own.



(4) We might turn now to a comparison of the specific members of the response series. To start with excitation. Here there is possibly a thoroughgoing disagreement between the two descriptions. For us excitation in the sense of neural action is not a separate factor but a constituent of every one of the four<sup>6</sup> reaction systems, to wit, attention, perception, judgment and report constituting the response. We do not conceive of any neural action alone preceding other kinds of action; but rather the neural action is a phase of the reaction system as a whole. If there is a deliberate disagreement between a structural view and an objective view here it is a very grave disagreement indeed, but we believe not inevitable. It is grave because, if the structuralist means to establish a permanent and actual difference between the neural fact and the mental fact (there is of course such a tradition), the structural position can never be reconciled with an objective point of view. That such a disagreement is not inevitable, however, we believe for several reasons. (1) There are psychologists who from an objectivist's standpoint are mentalists (Warren,<sup>7</sup> for example, who makes the two identical). (2) Boring himself must include a neural factor in several members of his series, attention and report for example. Whether he would care to admit this for perception we will discuss presently.

(5) Concerning the attention factor, this will not present us with any great difficulty, since attention being a fairly definite overt response the structural psychologist need not therefore differ so much from the objective psychologist as to what is involved in such action. We take Boring's inclusion of fatigue as a possible factor in the attention phase (p. 468) to support such a view. The same may be said when Boring undertakes to control attention by instructing the observer (p. 469). What else can "control by instruction" mean than that you ask the observer to do something of a somewhat different sort than to say "one" or to say "two?" Here we can certainly not avoid the fact that we are dealing with the mode of adaptation of our observer in the concrete psychophysical experiment. The writer is willing to make the mistake of assuming that no one will disagree that you can no more separate the mental from the rest of you when you obey the instructor's request to perform some particular act (speak) than when you are told to do something else (watch your action). In both cases you may attend to your actions besides performing them. Would it not be an unnecessary analytic sophistication to

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<sup>6</sup>These types of reaction systems we should say, since the reaction systems themselves are of course abstracted from the actual event; there may be thousands of them actually operating.

<sup>7</sup>Human Psychology, 1919.

divide up the person into a mind or mental process on the one hand, and the interacting or paralleling bodily process on the other?

(6) Next we turn to the perceptual factor, which not only is the crucial point in our harmonizing enterprise, but is also cheerfully admitted by us to be a very difficult factor to handle. Both the structural and objective positions maintain or lose their value depending upon their ability to handle the problem of perception.

Because the perceptual response is fairly intangible, representing as it does in implicit form some previous overt response, and also because a perceptual reaction may represent a unique organization of vestiges of previously performed reactions, it takes on the character of being fairly uncontrollable and certainly difficult to observe either by the reacting person or someone else. Now it is in these ways that perceptual actions are different from the other more overt factors in the reaction pattern, and if the matter of observability is the criterion we may well agree that perception constitutes a relatively "central" fact. As we have already suggested possibly it is the presence in our psychological behavior equipment of such intangible reactions that lends such plausibility to a purely mentalistic conception. That is to say, we strongly feel that the idea that there exist in psychology different aspects of the same response to a stimulus, namely mental and behavioristic, is based upon the existence of the more refined perceptual and ideational response besides the grosser reactions, attention and so-called habit acts.

And now we may ask whether this admission of the difficulty in observing the perceptual factor because of its implicit character constitutes a basis for agreement of what is involved in the entire experiment. Or would a structuralist not agree in looking upon the perceptual factor as a complex reaction system, in principle precisely like the other factors? Our doubt here arises from Boring's statement that the perceptual pattern as he calls it has a shape or form (oval, elongated, double paddle, dumb-bell). While he calls this "process material," one gets the impression from reading his description that he does think in terms of material of some sort. The impression is deepened when our author writes that "excitation culminates in perceptual pattern." While we prefer (both in order to keep our minds open with respect to Boring's description as well as not to close the avenue to agreement) to hold that his statement means merely that the one fact is followed by another, the statement might be taken to imply that the perceptual factor is a kind of qualitative material or process transformed from neural material (current). At least the process that is involved

may be interpreted to be something other than the total action of the person, even if it be thought of as an action within him or within part of him.

If the structuralist can agree with the objective psychologist upon this proposition, namely that the perceptual factor is a reaction system, an adaptational act of the observer in the experiment, then the two points of view can be brought into substantial harmony. For our part, we cannot discover any insuperable obstacles to such an agreement, and in fact we believe that in the following considerations is contained convincing argument for such harmony.

In the first place, we are on common ground as long as the structuralists agree in rejecting the notion that a mental state or perceptual pattern is any kind of stuff or quality, in favor of the idea that they are dealing with processes or acts of the individual. Külpe calls this perceptual process sensitivity and sensible discrimination, implying that this element of psychological fact is an action of the person. When the perceptual factor is looked upon in this way the difference between the structuralist's view and that of the objective psychologist disappears. To us the entire perceptual problem seems clear when we are dealing with a complex action pattern which can be divided into separate attention, perceptual, final report and other reaction systems. But how about the case in which there is only a single reaction system? In that case attention and perception may be looked upon as integral phases of that reaction system. Perception is merely the cognitive or discriminative factor of a response system. From the standpoint of objective psychology the cognitive factor in a simple act, that is, one that involves a single reaction-system (reflex for example), is that peculiar coordination of response and stimulus which makes for a specific act. Cognition is the fact that different objects call out differential reactions in the organism.<sup>8</sup> In a complex act (many reaction systems) each one involves a cognitive factor of this sort, and besides one whole reaction system may be cognitive in its function.

In the second place, much encouragement for the possibility of reconciling the structuralist and objectivist do we find in the criticism made by the structural psychologist of the behaviorist and psychologist of capacity. In this criticism the structuralist implies that all he means to insist upon when he argues for a "central" factor in the psychophysical experiment is that he does not believe that in this experiment we merely undertake the physical measurement of bodily response as a function of the physical quantities of the stimulus. We may entirely agree with him that a bodily act (muscle and nerve

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<sup>8</sup>Cf. a discussion of cognition in reflexes, this *JOURNAL*, 33, 25f.

action) is not a psychological datum and that the experiment must involve other factors. But the question is whether the introspectivist agrees with us that this central factor, which is an essential one in the total situation, is a complex response of the actual person and not abstract qualities of mind or consciousness.

(7) Turning to the final item in the reaction pattern, namely the verbal report, we need only remark here that the agreement is complete. Without any doubt whatever, the experimenter can look upon the report as a reaction unit comprising all of the factors that can be specified as integral phases of such a system.

V. *The Problem of the Stimulus-Error.* And now we are prepared to examine briefly the problem of the stimulus-error and how that problem affects the general inquiry into the possible agreement between psychologists. Heartily in accord are we with Boring in his insistence that not the best scientific results can be obtained by studying merely the response and the verbal report, for there is more than these involved in the situation. Let us frankly assert, as we have already intimated, that the psychophysical experiment cannot be understood and much less controlled without taking into consideration all of the factors (reaction systems) involved. In so far then as the problem of the stimulus-error means that we must not overlook the total series of response factors we must recognize the problem and avoid the error.

Let the reader observe, however, that to agree to study the middle factors in a reaction pattern does not at all supply any new element or support for a structural position, since as a matter of fact even the psychologist of capacity (Cattell) never denied the existence of those middle terms. For Boring tells us that the psychologists of capacity call these middle factors, attention, perception and judgment, inscrutable "middle terms." What they do deny is that these factors can be controlled and measured.

Boring, in his study of the psychophysical experiment, makes two assumptions which he believes materially support a structuralistic (datum) psychology. In the first place, he assumes that if we recognize the stimulus error and avoid it we thereby shall prevent ourselves from committing the psychophysical experiment to equivocal results. The second assumption he makes is that since the control of the response factors or the middle terms of the response conditions the validity of the experiment the structural hypothesis is thereby established. Now for our part we may readily and cheerfully admit that we get different results from the experiment depending upon whether the observer is paying attention to his response or not, as Friedländer's experiments on weight-lifting appear definitely to

indicate; but does this imply anything at all concerning the mentalistic character of the middle terms? Moreover, suppose that it be established that in some cases when the observer pays attention to his reactions he can offer more consistent and more predictable results,<sup>9</sup> does this fact alone establish that the middle terms are mentalistic?

Furthermore, as we have already written in a previous part of the paper we believe most emphatically that there exists a distinct difference between the perceptual member of the middle factors and both the preceding attention factor and the final verbal report. This difference we consider to be in large part that the perceptual reaction system is much less overt and consequently more capable of direct observation by the acting person than by anyone else. Again, we may repeat that we are convinced that the perceptual factor of the middle terms is much less easy to control than are the other middle factors; but in neither of these two cases can we agree that any support is found for a mentalistic point of view. Nothing in these two facts lends credence to the interpretation of our data in such a way as to separate the structural psychologist from the behaviorist or from the capacity psychologist.

On the other hand, we do believe that any suggestions concerning the possibility of controlling the middle terms in the psychophysical experiment must imply that they are something other than mental stuff of any sort, in fact reaction systems. Much confirmation do we derive for this belief from the fact that Boring himself does not appear to insist upon our ability to control the perceptual factor but mainly the attention phase, and the attention factor is by far the least equivocal reaction system for him; that is to say, it is apparently psychologically least mental in his estimation. This last statement we make however in full view of the fact that Boring apparently groups all the middle factors as mental in contrast with the verbal report.

What kind of psychological principle do we commit ourselves to, we might ask ourselves, when we recognize the problem of the stimulus-error and attempt to avoid it? Why simply this, that we accept the scientific fact that psychologists deal with different kinds of data from those of physicists, for example. In brief, the psychologist is interested in psychological facts,

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<sup>9</sup>It is not at all scientifically established whether we get better results from attending to stimulus rather than to response in all cases. In our uncontrolled observation and especially in golf as well as other responses evidence seems rather conclusively to favor attention to stimulus.

to wit, the reactions called out by stimuli, that is the activities of the observer in the psychophysical experiment.<sup>10</sup>

At the risk of digressing from the main trend of our immediate exposition we must suggest that to consider the psychologist's data as responses to stimuli-objects, irrespective of how we regard the responses, is a gain toward a generally improved situation among psychologists and a step toward agreement. For we believe that the older mentalistic view that made the work of the psychologist consist of an analysis of the same objects from another angle from that which interested the physicist was certainly not correct. For example, Titchener believes that psychologists study the same objects that physicists study "with man left out;" but the former study those things "with man left in." The difference then between the two scientists it turns out amounts to this, in the view of the structural psychologist, that while the physicist studies the same objects as electromagnetic waves, vibratory motion or molecules, the psychologist studies them as looks and tones and feels, that is as sensations and feelings.<sup>11</sup> That the structuralist cannot be consistent in this attitude is plain when he adds to the sensations as psychological data feelings, thoughts, emotions, memories, imagination and volition,<sup>12</sup> for clearly those are the acts of persons. Moreover, the structuralist says that "the man left in" reduces to the nervous system, which makes his data closely connect up, if not identical, with reactions.

To the credit of the structuralist, it must of necessity be said that by making sensations and physical energy aspects of the same things he is attempting to avoid epistemological problems,

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<sup>10</sup>We believe that at this juncture we get some light upon the argument of the anti-objectivists, to the effect that an objective psychologist has no right to assume any knowledge upon his part concerning his own responses. Because the objective psychologist assumes that he requires no idealistic epistemology in his work he is supposed to cut himself off from knowing anything about himself. The objectivist believes that when he observes his own reactions the knowing event is precisely as natural a phenomenon as when he responds to some other person's reaction. It so happens of course that when the psychologist experiments upon himself the responses that he observes are his own in two cases, to wit, (1) the reaction made when he offers the stimulus and (2) the reaction (his) to that stimulus; whereas when he experiments upon someone else he is interested only in the responses of the other person. The other person (observer) would, if the anti-objectivists were correct, be also cut off from knowing anything of his own behavior.

<sup>11</sup>Cf. Titchener, *A Beginner's Psychology*, 1915, 8ff.

<sup>12</sup>How the mentalist can hold such a view at all appears in our opinion to be accounted for by the fact that sensations are abstracted from the qualities of things and the other intellectual processes are made into derivations from sensations. Feelings of course remain outside this scheme and possibly this is the reason why psychologists have so strenuously attempted to make them into qualities or aspects of sensation.

but the difficulties he thereby creates are no less than those he overcomes. For he makes psychological data into peculiar abstractions as far as sensations are concerned, while the more complex reactions cannot be handled at all. And all this we believe can be rigorously avoided, as we have fully reiterated, by considering psychological data as responses to stimuli.

We come now to an extremely interesting phase of the stimulus-error discussion, namely the problem whether in fact the avoidance of the error means any slighter attention given to the stimulus even when one greatly increases his control over his own reactions to the stimuli in question. Interest attaches to this point because we insist that the control of the response involves at the same time a greater control over the stimulus. How can it be otherwise? For we believe most firmly that the psychological fact is the interaction of a response with a stimulus.

That the control of the response in the psychophysical experiment is at the same time a control of the stimulus, or at least involves prominently the stimulus, is evident when we consider that the errors in the experiment are not so much due to the neglect of the reaction as they are to the fact that the observer shifts his attention from his action to the stimulus and back again to his action. The only question here is whether a better control over the situation could be obtained by paying attention exclusively to the reaction, after paying attention to and perceiving the stimulus of course. In answer to this question we are not ready to say Yes, but we are thoroughly convinced that in any case what we are dealing with in psychology is a reaction to a specific stimulus and possibly we must conclude that it is always essential for both stimulus and response to be synchronously controlled.

Assuredly we find various evidences for the impossibility of minimizing the importance of the stimulus in the psychophysical experiment, and one of those is the fact that because the perceptual factor cannot be readily controlled, if at all, we must, when the problem of controlling responses is in question, place our emphasis upon the attention factor and the verbal report. Very significant is this fact since both of these factors are very definitely related to the stimuli factors of the experiment. Furthermore, unless we keep the stimulus under control as well as the reaction factors we cannot achieve any capacity to predict what responses will be made to stimuli. That this prediction must always continue to be very imperfect is due no doubt to an inability to control the perceptual process.

With the structuralist we believe we share this idea of the importance of the stimuli factors in psychophysical experiments, for Boring's insistence upon the control of the attention

factor may be definitely interpreted to stress this point. Also we find Boring's attitude favorable to our view in his belief that the control of the psychophysical experiment can be achieved by means of a criterion. For a criterion cannot be thought of as operating exclusively with a perceptual pattern but only in conjunction with the stimulus.

Let us notice that when we plan to control our responses to stimuli what we can do is to compare our own report, based upon our present judgment concerning what we have perceived with respect to the stimulus, with what we have judged a minute ago. But certainly it seems clear that we cannot control the kind of perceptual response we should make to any particular stimulus. Our control is bound to connect itself with more overt factors in the behavior segment than the perceptual reaction. Let us repeat, then, that what we do while paying attention to the response rather than to the stimulus consists of more carefully controlling our report with respect to the stimulus. Notice that we do not in any sense give up the stimulus, nor attach ourselves exclusively to the response, for the response doesn't mean anything without the stimulus. The condition might be entirely different, however, if we could assume that there is in us some quality which can be seen or otherwise known; in such a case we might consider that we could study it. But this assumption in our opinion could only rest upon an interpretation added to our observation in order to support a structuralistic position.

And now we hasten to add that nothing that we have written implies our rejection of the hypothesis that a verbal report follows a judgment response and that the judgment is based upon a perceptual response. What we do insist upon is that each factor constitutes a reaction system, a positive response of the person, and that all the response factors together make up a single reaction pattern to the specific stimulus in question with its experimental setting. To attempt to control the psychophysical experiment by attending to both stimulus and response results, in our opinion, in a closer connection between the perceptual factor and the stimulus.

VI. *The Data of Psychology.* We believe that the comparative analysis that we have made of the descriptions of the psychophysical experiment forces us to recognize that the data of psychology cannot be thought of as being anything else but actual responses of a person to specific stimuli. Any other way of describing the situation cannot be said to be an analysis of the facts in the case. Surely the employment of such terms as mental, physical or bodily, when intended as descriptive names, constitutes interpretations based upon some kind of assumption or set of assumptions. These assumptions we may



further say are not based upon observable facts whether found in this experimental situation or elsewhere. Rather, they are derived from some prepsychological or perhaps even pre-scientific domain of human thought.

Our analysis of the psychophysical experiment, which be it remembered we take to be in principle typical of psychological phenomena, has yielded, in our opinion, other results which locate the actual facts in the case and provide a basis for the agreement of psychologists. One of these results is that we may consider the psychological reaction to be made up of comparatively simpler unit reactions or that a large behavior or response pattern can be analyzed into smaller unit reactions.

Another fact concerning the data of psychology which we may accept as an actual product of our analysis is that some of the unit reactions in the psychophysical experiment are primarily overt responses while some are mainly implicit. In the latter instance the facts are in part not entirely observable and consequently involve some assumption. But here again the interpretation is we believe absolutely derived from the observed data and is essential, at the same time that it is supplementary.

In support of our contention that the data of psychology are in fact complex responses of organisms to things and not mental states or aspects of things, we may adduce the fact that in spite of psychologists' contrary theories their practice has always been based upon a reaction hypothesis. Take any book written by a professed structuralist and what do we find? There is not a single psychological activity which is described other than as a response to a stimulating condition. This is certainly true, is it not, of the simpler facts treated under the heading of reaction time? And when we come to sensations are not these always presumed to be abstractions from the adjustments of organisms, abstractions consisting of the differential factors removed from the rest of the adjustment action? This we assume is what is meant in part by psychologists who consider sensations as merely abstractions from perceptual acts, or when they consider sensations as correlates of receptor and neural functions. Moreover, unless the structuralist considers sensations to be phases of reactions would he not be inevitably and hopelessly committed to stimuli-errors? We come, then, to the conclusion that the interpretation of psychological data as anything other than responses to stimuli is the result of an influence extraneous to psychological analyses and in fact is the outcome of peculiar philosophic preconceptions. It is hardly too much to say that the entire psychophysical problem with the bitter battle it entailed concerning the quantification of mind was due to a preinterpretation of the

facts prior to a fair study of them. What makes the situation more difficult than it otherwise would be is that philosophic preconceptions are not knowingly accepted but merely taken over with the rest of the cultural traditions of the time. This condition prevails to a certain extent today and was the dominant circumstance in the earlier days of scientific psychology.<sup>13</sup>

Does not the very term psychophysics stand as a symbol that the work and method of scientific psychology was prejudiced at the outset? And was it not this prejudice that was responsible for the unending strife concerning the stimulus-error and whether what was assumed to be the psychological datum could be measured?

From the standpoint of the reaction hypothesis it is almost tragic how the various students of the psychophysical experiment have misinterpreted the more implicit elements of the reaction system of the psychophysical reaction and thus precipitated the controversies as to what was measured or whether what they wanted to measure could be measured. And so as to the identity of the datum; it was either made into something that manifested itself in action (verbal report, Fechner) or it was presumed to be a parallel or manifestation of nervous action (G. E. Muller), or again the datum was transformed into a judgment (is this not true of most psychophysicists?). In every case we believe the actual thing studied, namely, some part or the whole of the reaction to a stimulus, was interpreted to be something other than it actually is instead of being described as an existing fact. And most unfortunate it is that scientific or experimental psychology still carries with it the evil effects of not having been begun as a critical investigation of concrete facts.

*VII. How Metaphysics Influenced Psychological Interpretations.* Most clearly can we see the *modus operandi* of the philosophical background in experimental psychology when we look back upon the early development of the psychophysical experiment and scientific psychology in general. Now what do we find? At the beginning of the development of scientific psychology, when "psychophysics" as a technical scientific term was developed, the primary philosophical interests of Europe were still concerned very definitely with the epistemological problem how the process of knowing can mediate

<sup>13</sup>We wish to eschew absolutely the implication that we believe that the mistakes in early psychological work, if such we admit, could have been prevented, or that some individual or group of individuals is responsible for whatever difficulties one admits to be present in the early experimental work. On the contrary, we believe that the conditions attending Fechner's work made that work historically inevitable. But our whole point is, must we forever burden psychological science with errors that crept into it in its infancy?

between a known material object and its psychic correlate, and the question how the knowing process can reproduce in consciousness what is apparently a totally different form of thing. This interest, of course, arises from the theologico-metaphysical background which implies a diremption between spirit and matter, mind and body, and the mental and the physical. It was in the interest of this metaphysical problem and not in order to investigate a definite psychological problem of response or adaptation to a stimulus that Fechner undertook his work on the psychophysical problem.

In point of fact, Fechner entered upon his activities with regard to the psychophysical problem in an endeavor to establish definitely the identity of mind and matter (by the employment of the Herbartian suggestions of mathematical expression and his threshold mechanics) and not to investigate any psychological problem.<sup>14</sup> As a result his work was the target for a host of criticisms which could only be effective because Fechner sought to establish his religious or metaphysical theory by the utilization of physiological data. In other words, we might say that Fechner through his metaphysical interest prevented a more definite and more scientific interpretation of the sensory psychological data available and a more substantial research for more data.

But if the scientists who came after Fechner were more interested in the psychological facts than in the establishment of a metaphysical theory, their work still suffered from much the same philosophical bias. Though psychologists undertook to study assiduously the facts of association, memory and perception they did so with the assumption that they were bringing together the psychical and the physical. Experimental psychology, especially, consisted of bringing together physiological data with facts of knowing, feeling and willing which are in some sense different from the former. What was the result? In the case of Wundt's psychology (to mention one example which has had far-reaching effect upon current psychological thinking) the metaphysical influence was responsible for the misguiding of a voluntaristic point of view, which originally promised to study psychological phenomena as derived from a biological matrix, that is, from observable facts, into a hopeless intellectualistic abstractionism which Wundt himself deplored in Herbart and his predecessors.<sup>15</sup>

To our way of thinking the whole gamut of evil results brought on by the metaphysical influence upon psychology

<sup>14</sup>Says Wundt, in his address on Fechner (Gustav Theodor Fechner, 1901, 84): "Das ganze Interesse Fechners gehört eben nicht der Psychologie als solcher an, sondern diese ist für ihn nur ein Bestandtheil der Natur- und Religionsphilosophie," etc.

<sup>15</sup>Cf. Wundt-Titchener, *Principles of Physiological Psychology*, 25ff.

is that psychologists can still think of themselves as dealing with epiphenomena.<sup>16</sup> And just here can we find one of the most serious evils of attempting to interpret psychological facts in metaphysical terms. Since there can be no possible relationship between the observed facts and the interpretations, the facts are not interpreted at all and thus are blindly handled or else they are misinterpreted and in consequence are far removed from any progressive scientific development.

Is it too much to believe that if psychologists had started out from the beginning of their science with the study of the psychophysical experiment or the reaction time experiment as an existing fact they never would have made the division between mentalism and behaviorism or between mind and body? In our opinion this particular division is a cultural heritage from a definitely pre-scientific period of intellectual development; possibly it is merely a theological conception. The writer would suggest that in the present stage of scientific attainment we need have no such dualistic or monistic conceptions as the mental-physical dichotomy seems to indicate. Emphatically we may suggest again that to reject all philosophical preconceptions means that not only shall we not lose thereby the distinction between psychological and non-psychological facts but on the contrary we shall achieve a much more sensible form of distinction.

The untoward influence of metaphysics upon psychology has really been twofold, the first of which, to wit that the datum of psychology comes to be considered in theory at least not as a reaction to a stimulus, we have already studied. Now the second deplorable effect of spiritualistic philosophy upon psychology has been such that, even where the psychological fact is either in theory or practice considered as a reaction to a stimulus, the reaction is not looked upon as a concrete reaction or adaptation of the natural organism, but it must be interpreted as a mental or spiritual thing or process (epiphenomenon). We may turn now to an examination of the second of these misinterpretations of psychological data, which compels us to interpret them as anything but complex organismic responses to stimuli.

And first we might consider the peculiarly intimate character of human psychological phenomena. Every psychological reaction is in a definite sense a very particular kind of event; it is the action of a human individual, a person with a unique value of his own. This fact is recognized in one of the cardinal attitudes in psychology, namely, that the fact of individual differences in the cornerstone of the science of psychology.

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<sup>16</sup>Cf. Washburn, *Introspection as an Objective Method*, *Psych. Review*, 29, 1922, 89ff.

Moreover, we may well grant that much as we may know concerning the response of another person to a stimulus, that action is in a unique sense bound up with that person and his past experience. But yet this fact does not in any sense support a mentalistic interpretation; in fact we believe it even argues for an objectivistic interpretation.

Does the intimacy of an act make it anything other than a natural phenomenon? To answer this question we must first ask what we mean by intimacy. Do we imply anything more than that in a given time and place some specified event has happened to some particular individual? Now unless we especially desire to give our data a particular interpretative coloring we cannot overlook the fact which the events themselves present us with, namely, that if the event happened to a stone or any other physical object the event would be no less a unique occurrence of a natural fact. As a detail of scientific methodology the more accurately one can determine the spatial or temporal setting of an event the more elements one has to add to an objective study of the phenomenon no matter what particular sort it may happen to be.

A second characteristic of psychological facts which probably lends plausibility to the mentalistic interpretation of psychological data is their fleeting character. Because psychological facts are intermittent processes of brief duration and not subject to reappearance they are considered as different from other natural events; they are considered as psychic and not physical. That psychological facts are fleeting actions, that is again to say unique events, cannot be denied, but that this fact involves any sort of different situation than any other natural fact is preposterous to believe. Is it possible to revive any event, let us say the particular chemical reaction which I have just performed? It is true, of course, that some kinds of facts are so comparatively simple that we may, for practical purposes, say the securing of measurements, consider them as the same, although they are different events. But is this circumstance any different in the field of psychology from what it is in that of the other sciences? That even the simple physical facts are never the same and cannot be exactly repeated we learn from the pervasive and necessitous employment of the statistical method in the physical sciences.

Again the striking fact that some of the data of the physical sciences involve reversible processes may have strengthened the philosophical influence upon psychology. Some chemical reactions for instance are almost reversible, that is to say, such similarity is found in the things transformed or retransformed that the same event may be said to occur. An examination of this case impresses us with the fact that even if the measurements made give us the same results without averaging, which

of course is hardly the case, we could not consider these as repetitions of the same event without abstracting from the temporal variable. Furthermore, is there so much difference after all between the reversible chemical action and some forms of psychological phenomena? Certainly any language or learning situation shows a reversible reaction and a repetitive one.

Possibly by far the most potent source of mentalistic interpretation can be traced to the facts of self-observation or introspection. By this we mean that in human reactions there are certain ones which cannot be observed by anyone but the acting individual. Let us take a concrete case. From my window I see some person come out of the next building, walk about a hundred paces to the right, then turn around and walk back into the building. Soon the individual reappears with several volumes under his arm. We may be fairly certain that what we have here is a memory reaction. Apparently the person forgot to take the books he planned to take when he first left the building. Of course it is barely possible that this is not a memory act, since it might be true that the person did not go back for the books but for some other purpose. Seeing them, however, he decided to take them home. But at any rate, and this is the important point, the fact that this action may from the standpoint of the observer fall under two different classes, and for the reason that the observer cannot tell what the stimulus is, indicates the dependence of the description upon the reacting person.

Just what is the adequate stimulus in many cases the onlooker cannot know, even when he is sure what sort of reaction situation is being worked out. Suppose we put our illustrative individual under controlled conditions so that we may know he is performing a memorial reaction. Now in the case we have chosen, what is the stimulus that evokes the memorial reaction? It is possible that the person is performing the memorial response because he was stimulated by some books carried by another person. These books may serve as a substitute stimulus for some books he wishes to carry home, which books constitute the adjustment stimulus. On the other hand, it may be that this individual was stimulated by looking at a tree. The tree may operate as a substitute stimulus because one of the forgotten books contains some information on trees which the individual is interested in. Thoroughly to understand the behavior situation it seems necessary to know what the stimulus is in this case, and yet we cannot normally have that information. Again, in some cases the stimulus cannot be known to any one but the reacting person. This necessity of knowing what is the stimulus, let it be observed, exists only for us who wish to describe and understand the reaction and not in order that it be possible for the reaction to occur. It is

of course probable that while the memory reaction cannot occur without the substitute stimulus, the reacting person himself may not know what it is; it merely occurs to him, so far as he can tell, that he must return for the books.

What is true of the onlooker's knowledge of the stimulus phase of our illustrative behavior is always true perhaps concerning some phase of the reaction. But we question whether it is anything but a metaphysical presupposition which on this account takes the memorial act out of the domain of natural phenomena. For how many factors in the events which exclusively involve purely chemical and physical behavior are we always ignorant of?

And is not precisely this the function of the scientist, namely, to discover as many of these conditioning factors as he can in any kind of event, in order to give definiteness and authenticity to his observations and subsequent interpretations? The mere fact that we do not know what are all the conditions in this person's action certainly doesn't transform it into anything other than an objective event. This fact is obvious if we consider that the same situation prevails with respect to man's digestive conditions. Is it any less a purely objective fact that man digests food and a particular kind of food, if only the digesting person knows how and when this particular event is happening?<sup>17</sup>

But we have yet to face the problem of the cognitional uniqueness of human reactions. That is to say, a very distinct difference may be observed between what we call physical or natural events and what we term psychological facts in that the latter involve a knowing element. Not only does the person react to a stimulus, but he may know he is doing so.

In the first place, the question arises whether the fact of knowing is a mark of difference between psychology and other kinds of facts, because, as we have just indicated, many features of the individual's response may be unknown to himself, and this refers not merely to the stimulus side of the factors but to the response side also. Here we need only refer to the occurrence of reflexes and a host of responses popularly called subconscious and unconscious. As a matter of fact, then, the knowing of the action by the person who performs it is not an essential factor in the event; and therefore a psychological

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<sup>17</sup>Although Washburn (*loc. cit.*) assumes that her discussion of introspection supports an epiphenomenalism, the objectivist cannot be aught but encouraged by it, since even a professed structuralist means nothing more by introspection than objective description. Washburn's epiphenomenalism turns out to be, then, a matter of arbitrary preference, based perhaps as she suggests upon early training. We must, however, look upon her paper as a step toward the meeting of extremes.

event from this standpoint cannot be interpreted as a mental thing different from what is called a physical thing when that term is synonymous with a natural event.

But then we do have, of course, responses in which knowing is an essential factor, and our inquiry may be directed toward the question whether knowing itself as a fact is mentalistic in the sense of a non-naturalistic phenomenon. Before asserting our disbelief in this proposition let us ask whether we can get some light on this problem by inquiring why knowing is presumed to be mentalistic. This inquiry is stimulated by the fact that there appears an obvious difference between the act of picking up an object, say, and the act of intending or desiring to pick it up. Here again we must ask why the apparently "internal" implicit act is different in principle from any other kind of action. We are firmly convinced that the knowing or internal act is distinctly a response to a stimulus just as the picking up response, and moreover, a response to the same stimulus. Now the difference between them is that one we look upon as precurrent while we consider the other to be a final response.

The hiddenness of an act should be no inducement to think of it as a mental thing because certainly nothing could be more hidden from observation than the act of digestion. Obviously, we can know both events, at least in some cases, by particular means of experimentation. There yet remains the fact that the knowing is the action of the same individual who performs the final act. This point does not add anything more novel to the situation than the points we have already discussed. Our point is that all of the acts of the person, the knowing and the final overt (motor) responses, are purely definite natural events that happen to that particular individual.

*VIII. How the Data of Psychology compare with the Data of the Physical Sciences.* Remains yet the question, if the data of psychology are considered to be natural facts in principle like the data of the other sciences, wherein then lies their specific differentiation from the latter? So far as scientific investigations are concerned we may say that all scientists are interested in particular kinds of natural objects or things and the way they behave. For our present purposes<sup>18</sup> we might classify scientific facts into three general types, namely, physi-

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<sup>18</sup>Our present purposes are such that we neglect the fundamental principle that there are as many kinds of scientific facts as there are scientific interests and information.



cal,<sup>19</sup> biological and psychological. The physicist studies actions of physical things (leaves, stones, dynamos, light, etc.) and the actions of these things he finds he can sum up under various laws, the Newtonian laws in mechanics for example.

The biologist studies actions of things (organisms) which have different qualities from the objects which occupy the attention of the physicist. Biological things behave on the basis of stored up energy (action), facts which may be symbolized by the terms metabolism, irritability, etc.

Psychologists likewise study a type of natural thing, namely some person or animal.<sup>20</sup> What is of interest is that the psychologist studies behavior which differs in various definite ways from the behavior classed under the two preceding types.

For practical purposes we may attempt to sum up the essential psychological character of behavior under the six following headings, each involving a different relation or interaction of a stimulus and response: (1) variability of reaction, (2) differentiation of reaction, (3) modifiability of reaction, (4) integration of responses, (5) delay of reaction, (6) inhibition of reaction.

(1) *Variability of Reaction.* When a psychological organism comes into the range of stimulation by an object, the relation or interaction between the two continues to a definite conclusion, frequently with a great variety of movements upon the part of the organism until one of several things happens. That is to say, until the organism (*a*) changes its relation with respect to the stimulus; (*b*) produces some effect upon it; or (*c*) the stimulus disappears or becomes invisible; or (*d*) the animal is fatigued or exhausted. The number and intensity of these variations are determined of course by the specific details of the situation. (2) *Differentiation of reactions.* At the basis of the variability of behavior as well as of some other marked action characteristics is the process of differential reaction. In a general sense, we may say that different specific objects and persons or qualities of them produce different effects upon the organism, which in turn exhibits a differentiative sensitivity toward those objects and qualities. (3) *Modifiability of reactions.* In general the characteristic of modifiability of

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<sup>19</sup>Here we must make sure that our language does not betray us into a nest of difficulties. The term 'physical' is here used in a technical sense as the domain of the physicist. When the term 'physical' is taken to mean natural as over against the metaphysical world of epiphenomena psychology, of course, constitutes a branch of the physical sciences. If the writer may offer his personal opinion the world of epiphenomena is nothing but a series of verbal constructions.

<sup>20</sup>From a psychological standpoint the thing studied may be considered as primarily a series of reaction systems to specific stimuli.

response permits the organism to profit by its previous contacts with those objects and in consequence allows the individual to develop a growing power over his surroundings. Thus we might say that the modifiability of behavior is a genuinely acquisitive process; the child, for example, who modifies his original hand-extension reaction to the candle flame acquires a withdrawal response or in other words learns to withdraw or not to extend his hand into the flame. We may think then of the characteristic of modifiability as a discrimination of stimuli, discrimination conditioned by previous reactions to those stimuli and also by present variation in the environmental settings of those stimuli objects. (4) *Integration of Responses*. Not only does an organism perform differential reactions to objects and modify those reactions but it also summates these responses. The psychological organism develops complex response systems which can be definitely observed to be combinations of simple reactions. As an example of this integration we might consider the development of speech. At first the infant learns to make single verbal responses to objects. Later the single word responses become integrated into sentences or comprehensive language reactions. (5) *Delay of Reactions*. This is brought about in two ways: first, the stimulus excites a reaction system or series of reaction systems which function incipiently until such a time as an overt response can be performed. Let us observe at once that the incipient acts may be overt responses in the sense that some direct action is performed upon the stimulus-object, but the final overt act is the significant one. Thus, in the case of a delayed reaction of an elementary sort, some overt act in the form of a posture, or bodily set or orientation, will serve to fill in the gap between the stimulation and the final response. Or secondly, some object other than the original stimulus but which substitutes for it can at some later time excite the person to respond to the original object. In the first case, the various positive attitudes of the organism may serve as preliminary reactions to the final act; they are then called precurrent responses. In the second case, there is an actual discontinuity in the behavior of the organism. Both of these forms of delayed reactions constitute phases of memory behavior, the latter of which is of course the more complex and the more serviceable to the organism which is able to react in that way. (6) *Inhibition of Reaction*. Another characteristic of psychological action is the inhibitory process. Let it be carefully noted here that by inhibition we do not mean non-action but merely preferential reaction. That is, there is a differential and preferential operation of the various reaction systems which the organism has acquired. For various reasons some stimuli may become prepotent over others, as in the case

of a more favorable setting which they may have, or because they have just operated upon the organism which is now especially sensitive to them.

So far as human psychology is concerned we may say without hesitation that the datum is a response of a person. Now if we agree to dispense with any kind of metaphysical implication we mean by person nothing other than what is implied in our everyday speech. We do not go behind the person to a metaphysical substance called the soul or mind, nor do we reduce him to the abstraction of a body. Rather we consider him as a complete psychological machine operating in contact with stimuli exactly in the same way as the physicist considers a dynamo.

Recent investigations made with human individuals both normal and abnormal have resulted in a conception of personality which shows fair promise of developing into a point of view capable of doing justice to all of the complex and intricate facts of human adjustment. The analysis of this individual in action yields us much information concerning both the simpler and more complex unit reactions, which under the name of reaction systems are abstracted from the actual behavior of the person in his surroundings. In our estimation the psychological conception of personality refers to the particular group and sum of reaction systems that can be described as adaptable or maintenance reactions in their simpler forms and as economic, aesthetic, literary, cultural, intellectual, moral, etc., when the reactions are very complex.

The merit of these abstractions lies merely in the fact that they are directly derived from the observable behavior of the person and they can be further reduced for more minute investigations to the simpler muscular, neural, discrimination and other functions of which they may be said to be composed.

*IX. How can Psychology be Emancipated from Metaphysics?* That psychology needs to be relieved from its entangling alliance with spiritualistic philosophy is manifest from the unfortunate results which accrue from such a connection. As we have been attempting to point out, psychology's contact with metaphysics may be summed up in the proposition that the data of the science have been taken out of their actual concrete setting and transformed into various sorts of abstractions. This amounts to nothing less in practice than that the data of psychology are prejudiced before they are studied. The method of doing this has been as follows. Starting with the assumption that our stimuli consist of radiation of various sorts, psychologists have had to suppose that the colors, tones and other qualities of natural things could be created or transformed in the mind, from the light rays, etc., by means of a

nervous system. Consequently the psychological reaction had to be reduced to the process of "being qualities" (sensations). This attitude was formulated in the statement that the "mind" consists of these processes (sensations), etc., as over against the body and the stimuli. That the nervous system could be spared from reduction to radiations and mental qualities was only made possible by the psychologist becoming contemptuous at this point of the self-same metaphysics which brought on the problem. In the meantime, of course, psychology is not occupied with its own essential problem, namely the adaptations of persons to things.

And yet what appears to be the psychologists's deplorable occupation with the abstractions which we have been discussing is not without the encouraging feature that the whole procedure represents an attempt to place psychology upon a critical scientific foundation. In fact, this whole tradition of abstract psychology has been developed especially by Wundt and his followers in an admirable scientific spirit. And so psychologists seized upon what at the time of experimental psychology's birth were definitely established scientific facts, namely light rays, etc. The unfortunate feature of the situation, however, was that the metaphysical influence urged psychologists to correlate the abstractions of physics, taken to be the material world, with comparable mental abstractions, namely sensations, which were assumed to be the mental correlates. Because this was all done in order to make psychology into a science, however, the encouraging fact remained, namely, that the way was never closed to a modification of point of view which we believe is now making rapid headway.

Once more let us emphasize this point, that the abstractions we have mentioned, although necessary and valid for the physicist, cut the psychologist off from the study of the concrete reactions of human and infrahuman organisms to air, water, food, mates, art, science, etc. Are not light rays, air waves etc., in general very remote from actual psychological facts? For we assume that it is light and not light rays that have to do with stimulation, and furthermore light itself does not ordinarily constitute stimuli but is really the medium of contact or stimulation. Of a surety light and light rays may be stimuli-objects for the physicist when he studies them; but this is a special sort of psychological fact. Most certain it is that no science can go far without abstractions, without cutting its data up into bits which may little resemble the original wholes, but our entire insistence is that so far as psychology goes the gross

data should be the facts of the psychological domain itself.<sup>21</sup> For otherwise we may borrow abstractions in quantities from physics, from chemistry, and from other sciences, but they will serve not one whit to illumine our problems or to aid in solving them; since the facts of psychology, as we have seen, are clearly distinct from those of physics and the other sciences.<sup>22</sup>

Let the reader be warned that we do not base our argument at any point upon the necessity for achieving practical results in psychology. We are not interested for the moment in applying our scientific principles, although it is undoubtedly true that the sounder our principles are the better results can be achieved when we do apply them. Every psychologist must be struck with the success of certain features of the Freudian psychopathologists, those features we mean which have undoubtedly thrown much light upon psychological phenomena. No, our suggestion is made entirely for purposes of understanding psychological facts; for purposes of analyzing our facts we ought to approach nearer the actual occurrences. Let it not be said that the technical psychologist understands much less about human beings and their behavior than novelists or students of hysteria. In this connection we might suggest how much better off psychologists would be if they paid more attention to the concrete conditions of memory and thinking (as some psychologists are beginning to do) than to anything that has to do with the mental and the physical. For we may plainly say that there is nothing in nature which is mental or which is physical in any other sense that that natural phenomena can be divided into psychological and physical phenomena. Scientific psychology, in common with all the other sciences, selects its facts from the common source of natural phenomena and these facts comprise physical reactions, biological and geological facts, psychological responses, etc. The only use we can make of metaphysical abstractions is that by their employment we may dissolve facts into metaphysical concepts which we can in turn use to bolster up the metaphysical background of our science. Should such a background be tolerated?

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<sup>21</sup>This point refers to all abstractions: we are no better off when we take our abstractions from the biological domain than from that of physics. The so-called orthodox behaviorist takes his abstractions from the biological world and for this reason appears to keep closer to actual facts than the introspectionist who denies that sensations (color and other qualities) are abstracted from objects. For muscle action, nerve action, etc., are clearly abstracted from observable data. But even so the behavioristic abstractions are not of great value in psychological investigations.

<sup>22</sup>It is indeed gratifying to read in the newer textbooks overt statements with respect to the distinctness of the scientific field of psychology. Cf. Woodworth's treatment of color reactions in his *Psychology*, 1921, 210 ff.

Most firmly do we believe that all scientists theoretically appreciate the disservice brought to science by metaphysical presuppositions, and also that it is common knowledge that no scientific enterprise can be carried on without some fundamental assumption. We are in duty bound, then, to draw up a closer bill of particulars in our protest against the metaphysical wrongs committed in psychology. Let us specify, therefore, that we mean to rid psychology of metaphysical or transcendent philosophies and complete the emancipation of our science by retaining only or developing a logic or methodology of science. What would be the difference then between these two? Nothing less than this, that instead of entertaining presuppositions concerning the nature or identity of things before anything is studied, the psychologists will develop assumptions concerning the operation and meaning of psychological facts actually observed. Only from such assumptions and hypotheses may we hope to develop methods of discovering new data and newer methods of studying them. Incalculable would have been and could still be the application of such methodological principles in the study of instincts, emotions and intelligence, as the history of these problems amply testifies.

But here again we are entirely willing to agree that our suggestion contains nothing new. In fact Wundt makes a great deal of metaphysical presuppositions and methodological processes, but the question is whether his suggestion is in fact acted upon. The criterion lies here. When I perform a psychological act is my action divisible into a physiological part and a psychological part? We believe not, when we approach the fact without prejudice. That psychologists can agree upon this is eloquently testified to by the following quotation from a writer whose psychological position stands at the opposite pole from that of the present writer. Says Wundt: "the life of an organism is really one; complex it is true, but still unitary."<sup>23</sup> In spite of such a statement the metaphysical influence is responsible for the division of an action into mental and physical parts. We have then the result that while Wundt looks upon the mental processes (mind) and the physical processes (neural action, etc.) as conceptions, that is scientific interpretations of the reaction, he soon makes psychology into the science of mental states which are clearly different sorts of facts from the neural, although he still insists they are uniformly "connected" with those neural facts. Wundt's scientific path is here made smoother by the fact that according to his philosophical position both the neural and the psychic facts are ultimately reducible to homogeneous spiritistic stuff. Furthermore, now that the reaction is divided into physical and mental the same division

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<sup>23</sup>Physiological Psychology, 1.

is made to apply to stimuli objects, and a (perceived) tree, for example, is made to consist of a natural science part and conscious content part. The total results of this situation are in our opinion inimical to the interests of scientific psychology.

X. *Conclusion.* In concluding our paper we might briefly summarize some of the salient points that we have attempted to investigate.

In general, we might conclude that it is most essential for the purpose of psychology that the various workers should agree upon fundamental propositions. For in psychology, as is not true in other sciences, the disagreements go back to the primary data of the science, the things observed, and do not involve merely interpretations of things studied. As a consequence, psychologists not agreeing upon their fundamental data are much occupied with preinterpretations which for the most part unwittingly play havoc with both the facts and the science.

That psychologists might agree upon their data and primary methods we have concluded from a comparative study of a subjective and objective analysis of the psychophysical experiment. In each case the facts studied are first approached as definite responses to carefully controlled stimuli. Possibly in any careful study much the same agreement could be accomplished with respect to interpretations, but this condition, while very desirable in the interest of the science as a whole, is not of equal moment with the necessity of agreement with respect to fundamental data.

On inquiring as to the conditions which make possible such violent disagreements as we find in the domain of psychology, we may trace the difficulty back to a traditional acceptance of a faulty philosophical background. To divide an organism's action into mental and physical and to make the data of psychology into anything but responses to stimuli is not a scientific enterprise but a metaphysical one. The way to clear psychology of such metaphysical obstacles is to eliminate all transformative presuppositions and to make the hypotheses and assumptions refer to methods of investigation and interpretation rather than to variant existences.